H 10(7)

SELECTIONS FROM THE RECORDS

OF THE OFFICE OF THE

FINANCIAL COMMISSIONER, PUNJAB.

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LAHORE :

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Selection from the Records of the Financial Commissioner's Office, No. 22.

No. L.—QUALITY OF BARLEY IN THE PUNJAB.

No. 418, dated 5th September 1876.

From—F. F. Collins, Esquire, Offg. Principal Veterinary Surgeon, Bengal Army,
To—The Deputy Adjutant-General, Royal Artillery in India, Simla.

I have the honor to acknowledge the receipt of the enclosed letter No. 501—10, dated 19th August 1876, from the Officer Commanding Royal Artillery at Umballa, also a sample of the gram issued to the Royal Artillery horses at Umballa, as also samples of gram and barley issued to the Royal Artillery horses at Jullundur, forwarded with your memorandum No. 1388, dated 22nd August 1876.

I also beg to acknowledge the receipt of similar samples from Sialkot, Peshâwar, Mooltan and Meean Meer.

I have tested the whole of the samples forwarded, and herewith beg to forward my report thereon.

JULLUNDUR.

Gram good, free from impurities of every kind; but new, almost too new for issue.

Barley small, badly nourished, and largely adulterated with indifferent wheat, indifferent gram, and three different kinds of small seeds. Half-an-ounce by weight of the sample contains $\frac{1}{8}$ of the above adulteration; nearly the whole of the barley has a peculiar rusty blue appearance indicating damage by wet, and, by removing the husk, the membrane proper to the seeds distinctly indicates the appearance of blue mould: sample enclosed.

UMBALLA.

Gram good, free from impurities; but new, almost too new, I conceive, for issue. Absorbs moisture rapidly and germinates in about twenty hours.

No barley issued.

SIALKOT.

Gram seeds small, not well nourished, apparently gathered early in the season, and takes twice the length of time to germinate as compared with the other samples forwarded. Is below the average of gram.

Barley very inferior indeed, slightly adulterated with wheat, and seeds of the wild vetch, apparently. Half the sample presents the appearance of wild barley; grain small and have a considerable preponderance of husk, and the whole presents, more or less, a damaged appearance similar to the sample from Jullundur.

PESHAWAR.

Gram new and of average sample.

Barley the worst of all the samples forwarded, is very dusty and apparently much damaged by wet and insects.

MOOLTAN.

Gram new, but of fair quality. Barley; none issued.

MEEAN MEER.

Gram new, but of fair quality. Barley : none issued.

By the foregoing comments upon the specimens of gram forwarded, it will be seen that the gram issued to the troops is new, and, as a rule, good, the exception being that from Siálkot, which appears to be below the average quality.

The gram from Jullundur and Peshawar I almost conceive is too new for issue, many of the grains not being sufficiently matured.

The best sample of barley forwarded, is but a very poor type of well nourished grain,—the seed proper being small with a preponderance of husk, thereby assuming the character of wild barley; and the whole of the samples forwarded indicate a mouldy taint arising apparently from the effects of damp.

Good barley should present a plump appearance and possess a thin husk, and should also be of an uniform straw colour. The whole of the samples of barley forwarded, besides being indifferently nourished, indicate the presence of blue mould, a diseased condition caused by the ravages of microscopic fungi, and the barley from Peshâwar, besides indicating this blue mould, is, from its dusty appearance, also attacked by insects,—of this I feel morally satisfied. A powerful microscope will alone disclose this point.

I have tested the germinating properties of all the samples of barley, and I found the deeper the blue tinge in the seed, the less disposed it was to germinate, and some seeds so affected would not germinate. When the husk of the diseased grain is removed, the deep blue tinge of the membrane proper becomes more apparent, as will be seen upon reference to the package marked with a blue cross in the Jullundur samples.

This membrane, like that of wheat, is composed of four layers, and, like wheat, is liable to the same diseased condition, as also is the seed itself.

It is well known to medical science that rust or mould in wheat induces diarrhœa, indigestion, and even paralysis in the human subject, and, if we may judge by analogy, I think we are justified in looking to this source for many of the enteric equine ailments to be met with in India.

The whole of the samples of barley forwarded, from being insufficiently nourished, I conceive unfit for issue, and I also conceive that barley, even of the best quality, if diseased similarly to the samples forwarded, would be found highly prejudicial to health, and I feel it my duty in consequence to express myself most strongly against the issue of barley in the above diseased condition to the government horses in the presidency.

The various samples commented upon I herewith beg to enclose.

No. 490, dated October 1876.

From—The Officiating Principal Veterinary Surgeon, Bengal Army;
To—The Adjutant General in India.

In reply to your memorandum No. 2175 B., dated 3rd October 1876, having reference to the Commissary General's letter No. 1320, dated 21st September 1876, soliciting that the Veterinary Surgeon, 4th Hussars, may be requested to state the grounds upon which he framed his report condemning the quality of the barley rations issued to the Government horses at Râwalpindi; I have the honor to state, for the information of the Government of India, that on the receipt of the Veterinary Surgeon's letter upon the subject, I obtained a sample of the barley rations

issued to the Government horses at Ráwalpindi, and I can, therefore, enter into the subject of the quality of the barley issued at that station without further reference to the Veterinary Surgeon.

I inclose herewith four packages numbered, respectively, 1, 2, 3 and 4, the first three of which contain collectively half an ounce by weight of the sample of barley ration I received from Ráwalpindi. No. 1 contains the best sample of barley picked from the half ounce; No. 2 the inferior sample; No. 3 the damaged sample picked from the half ounce; and No. 4 contains barley seeds from the sample, denuded of husk.

The seeds in No. 1 package will be found fairly nourished, but very many of them distinctly indicated the appearance of blue mould, or, in other words, have acquired abnormal properties by becoming, through damp, infected with cryptoganic growths due to the "*Mucor mucedo.*"

No. 2 package contains seeds of very inferior growth, the seed proper being small and the husk large,—in other words, partaking of the characteristics of the wild grain; such seeds will be found difficult either to grind or masticate, and, consequently, the majority of such seeds would be lost to the animal economy if issued for feeding purposes.

Damaged seeds will be found in No. 3 package, and I think it needless to dilate upon their condition,—the seeds speak for themselves.

In No. 4 package will be found seeds denuded of husk, some few will be found of the natural healthy straw colour, whilst the remainder exhibit the attack of two descriptions of fungi. The brown or rust coloured seeds arising either from the "*uredo*" or "*puccinia*" species of fungi and the blue mould from the "*mucor mucedo.*"

The introgenous elements of plants are readily soluble in water and therefore become influenced by damp. Forage may thus be affected and lose their nutritive qualities by exhibiting what is commonly called "rust," "smut," "dust brand" or "blue mould," according to the condition favourable to the development of the various description of fungi.

These diseased conditions impart to such description of aliment properties prejudicial to health is well known both in human and veterinary medicines.

The number of casualties annually among government horses in the Bengal presidency from enteric diseases alone, is fabulously high, and in consequence of the many diseased samples of ration barley I have obtained from stations in this presidency, and not feeling satisfied to what extent this diseased grain may influence the number of such casualties, I have been for some time preparing numerous samples for reference home for investigation, both microscopically and otherwise, for the opinion of the highest recognised authorities in such matters.

No. 647, dated 6th November 1876.

From—The Executive Commissariat Officer, Rawalpindi;
To—The Deputy Commissary General, Umballa.

In returning the annexures of your No. 4012, dated 2nd instant, I have the honor to observe—

1st. That the Principal Veterinary Surgeon has omitted entirely to state from whom he received the sample of barley he has reported upon. Further, he has failed to state under what conditions it was obtained, and how it was forwarded to him. Barley when issued by this department is inspected by an officer before being accep-

ted by regiments and batteries, and it must be manifest that it may get wetted or damp after issue by this department. The sample under reference may even have got damp in transit; altogether then, I demur at the sample in question being accepted as a fair sample of the barley issued at this station. My own experience leads me to quite a contrary conclusion.

2nd. It needs but little more than ocular demonstration to evidence that the barley grown in the Punjab is of very inferior quality to European grown barley; but in my opinion the barley issued at Ráwalpindi is neither better nor worse than that issued at other stations in the Punjab.

3rd. I have examined the samples of gram contained in the parcels annexed, with great care, and have shown them to others having experience in the quality of cereals.

I have no hesitation in saying that I believe the seeds contained in packet No. 3 have never been damped at all by weather or otherwise, *but they are simply unripe—the plants from which they were taken having been cut before the gram was fully matured.* This is itself evident from the state of the husk, which shows no signs of damp or mould.

4th. It appears to me that the Principal Veterinary Surgeon has laboured to show that the barley issued in the Punjab is inferior, and from samples collected by himself, attempts to prove that it is not only innutritious, but even deleterious to equine health. The first point may be said to be established, for not only is the barley in the Punjab infinitely inferior to that procurable in Europe, but it is even inferior to that procurable in other parts of India, notably to that obtainable in Bihár and Rájputána. As regards the second point, I can only say that, even if it be admitted as established that there is a large admixture of inferior grain in the barley issued in the Punjab, this would not appear to warrant an opinion that barley should not be issued at all in the Punjab, but would seem to me rather to indicate *that it should be more carefully inspected before issue. To ensure its being so* I would, therefore, propose that the allowance for cost of picking and cleaning and for loss therefrom should be increased in the Punjab, and that a Veterinary Surgeon should inspect the daily rations of forage issued to mounted corps.

No. 1614, dated 10th November 1876.

From—Colonel T. H. Sibley, Deputy Commissary General, Upper Circle, Umballa,
To—The Commissary General, Fort William.

With reference to his No. 1707 S., dated 28th ultimo, the accompanying * explanation of the Commissariat Officer, Ráwalpindi, is submitted with return of Government letter No. 1006 S., dated 27th October 1876, and its annexures.

* No 647, dated 6th November 1876.

2. It appears that in the opinion of the officiating Principal Veterinary Surgeon, all the barley in the Punjab is more or less diseased with a mouldy taint; this is a subject which might be with advantage taken up by the agriculture department, with a view of ascertaining whether all the seed in the Punjab is so diseased at time of the harvest, or whether it becomes damaged after it is cut and stored.

Enclosure to No. 57 of 17th January 1877, from Government, Civil Dept.

3. Much benefit would be gained if greater attention were paid by cultivators to the selection of the seed used, and there is little doubt that the grain seeds in this country have deteriorated by using always the seed grown in the same field or districts, whereas if fresh picked seed were imported from a short distance, much better

crops would be raised. This subject can only be pursued by the agriculture department, and carried out by the energetic assistance and influence of district officers ; but it is one of vital importance.

4. The reports of the other executive officers in the circle on the subject will be submitted in due course, with a separate report on the subject generally.

No. 4, dated 9th January 1877.

From—C. J. Lyall, Esquire, Under-Secretary to the Govt. of India, Dept. of Revenue, Agriculture, and Commerce,
To—The Secretary to the Government of the Punjab.

With reference to your letter No. 1823, dated the 2nd November 1874, I am directed to forward a copy of the papers noted in the margin, on the subject of the inferior quality of the barley issued to mules and horses in the Punjab, and to request that the question of improving the seed of the barley grown in that province, may, as suggested by the Deputy Commissary General, Upper Circle, be enquired into, and the result reported to the Government of India.

From the principal Vety. Surgeon. Bengal Army, to the Dy. Adjt. Genl., R. A., No. 418, dated 5th September 1876.
From Do. to Adjutant General, No. 490, dated October 1876.
From the Ex. Comt. Officer, Ráwalpindi, to the Dy. Comy. Genl., Upper Circle, No. 647, dated 6th November 1876.
From the Dy. Comy. Genl., Upper Circle, to the Comy.-Genl., No. 1614, dated 10th November 1876.

No. 57, dated 17th January 1877.

Endorsement by Government Punjab.

Copy of the above, with enclosures in original (to be returned), forwarded to the Secretary to Financial Commissioner, Punjab, for enquiry and report.

No. 548—51, dated 1st February 1877.

From—The Secretary to the Financial Commissioner, Punjab,
To—The Commissioners Jullundar, Amritsar, Rawalpindi and Peshawar.

Forwards copy of No. 57 of 17th ultimo, from Punjab Government, and of its annexures, on the subject of the inferior quality of the grain issued to government horses and mules, and requests that the Deputy Commissioners of Jullundur, Sialkot, Rawalpindi and Peshawar, may be called on to report if the barley is, as stated by the Deputy Commissary General, Upper Circle, mouldy at time of harvest.

2. (Extra para for Commissioner Rawalpindi). Commissioner is also requested to enquire from the Murree Brewery Company if any difficulty is experienced in procuring barley fit for malting.

No. 552, dated 1st February 1877.

From—The Secretary to the Financial Commissioner, Punjab,
To—The Commissioner, Umballa.

Forwards copy of Punjab Government No. 57 of 17th ultimo and annexures' regarding the inferior quality of barley issued to government horses, and requests he will enquire from the Simla Brewery company whether any difficulty is experienced in getting barley for malting.

No. 1781, dated 8th March 1877.

From—The Commissary General, Fort William,
To—The Secretary to the Government of India, Military Department.

In continuation of para 2 of this office No. 6406 dated 23rd November 187 to your address. I beg to submit copy of a communication No. 203 dated 8th Fel ruary 1877, from Colonel Sibley, Deputy Commissary General, Upper Circle, givin an abstract from the reports of Executive Commissariat officers on the subject the quality, &c., of the barley at certain stations in the Punjab.

2. With a view to obviate, as far as practicable, a recurrence of the complain made against the quality of the barley in the Punjab, the Deputy Adjutant Genera Royal Artillery in India, was addressed in letter No. 6950, dated 19th Decemb 1876, (copy attached), with reference to certain extracts from the inspection r ports of the officiating Principal Veterinary Surgeon sent to this office, for any r marks or action that might be considered necessary, and it was pointed out, th if barley was considered objectionable, quarterly committees need not determin that it should form part of the grain ration of horses. A copy of my letter abov quoted was also sent to the Deputy Commissary Generals for communication t Executive Commissariat officers in the circle, for information and guidance. Con plaints of the subject have not since been received.

No. 203, dated 8th February 1877.

From—Colonel Sibley, Deputy Commissary General, Upper Circle, Umballa,
To—Colonel Willes, Commissary General, Calcutta.

I beg, in submitting the subjoined reports from the other executive officers i the Upper Circle, as promised in para 4 of my No. 1614 and para 2nd of No. 180 dated 10th November and 19th December 1876, to state that in my No. 161 I have stated all that can be traced by our officers regarding the inferiority of th barley produced in the Punjab, and the blue appearance in the grain.

2. I annex an extract from the *Pioneer* newspaper of an article on the cult vation of barley, which corroborates the opinion given in the 2nd para of my N 1614 regarding the deterioration of the same seed for many years in one district.

3. As regards the bluish appearance of grain, attention is solicited to the e tract per margin, for ready ref ence, from the report of Ma O'Donel at Mooltan, and it is sirable that the nature of t blue appearance should be ve carefully enquired into by a co petent chemical analyst, wit view of determining whether i a deleterious blue mould, or natural appearance of the gr in these parts, as asserted by natives of Mooltan.

"The Principal Veterinary Surgeon may be correct in attributing the bluish appearance to mould, but on the other hand it may be peculiar to the grain itself, and it is very desirable that the result of chemical analysis should be made known. He is further informed by natives that in purchasing barley they look for this bluish appearance as a mark of good quality. The same barley washed and cleaned is under existing orders supplied to Hospitals for the preparation of barley water, and if it is injurious to horses in health, it must be much more deleterious for men in a weak or bad state of health, but the medical officers do not complain of the quality of the barley supplied."

4. Although the facts are not acknowledged in India, it is stated in all best standard works, that when barley is given to horses it should be well crusl and if this is not done, whole barley is not well digested by the animals. Gre attention must be paid to parching and crushing all barley before it is given ration to horses.

UMBALLA.

Barley has not been issued to horses of mounted corps at the station for the last 6 months. In accordance with Committee's report only gram is issued. When barley was issued before July 1876, there was no condemnation by any mounted corps; but the officer commanding XI Hussars in some instances reported about barley being thin and not clean.

KASAULI.

Barley is not produced in this division, it is procured from the plains for the battery mules at Jutogh, where no objection has yet been raised in regard to its quality; seven-tenths barley, and three-tenths gram is generally used; it depends on the cost of each.

JULLUNDUR.

Has been unable to perceive any blue mould in samples of barley lately examined by him, nor, until he perused letter No. 418 of 5th September 1876, from the Principal Veterinary Surgeon, had he ever remarked or heard of the barley of that district being affected with blue mould, or being in any way injurious to horses or cattle.

The barley grown in that district is certainly of an inferior quality; it is small with a great deal of husk and badly nourished, and is always brought to market largely mixed with other grain, such as wheat, gram, &c.

Commanding officers and Veterinary Surgeons sometimes complain of the barley for its inferior quality, even when the very best procurable there has been tendered to them; but it has never been represented that the barley was unwholesome, nor have any horses suffered from using it.

Barley locally procurable of poor quality and usually about the same price; recommends that gram alone be supplied for the use of the Government horses at that station.

Barley of a superior quality might be imported from other districts, but its price at Jullundur would be much higher than gram.

He knows not when the Principal Veterinary Surgeon obtained the sample of barley from Jullundur, but the sample appears to have been inferior to that description of grain usually issued at that station, and that the class of barley produced throughout the district cannot be reasonably judged of from one sample, and that he cannot account for the blue mould in barley and can only attribute it to the grain being cut before it is quite ripe. It is not probable that any large quantity throughout the country would be damaged from wet.

FEROZEPORE.

From enquiries made, blue mould in barley does not appear to be general in the Ferozepore and surrounding districts, but that if the grain is stacked immediately after the harvest in a damp place or before being thoroughly dry, it is liable to be attacked by blue mould.

The natives say that a good preventive is to stack grain (barley) after harvest on a layer of sand or straw and covered with the same; much rain in harvest time would probably cause the barley of that particular season to be attacked with mould, but it is not the usual thing.

MOOLTAN.

No complaints were made regarding the quality of the barley issued to the Artillery horses at this station, until the arrival of the Principal Veterinary Sur-

geon. Since then, the barley has thrice been condemned by regimental commi tees. It was, on the only occasion of it being submitted to a special committe passed as good and fit for issue. Brigadier General Macpherson, C. B. and V. C also expressed his opinion that the grain was sound, but that there was a prepo derance of husk. From an experiment made regimentally, it would appear tha after the grain was parched the husk was removed, and the weight of husk foun to be nominal, quarter (¼) of the weight was lost in parching, and it is more tha probable that a large quantity of the husk was consumed in the process. All th best barley procurable in that district has a bluish tinge; a very much inferi quality is grown on portions of land inundated by the rivers; but of this the grai is so very small, it is never tendered.

MEEAN MEER.

He is unable to trace either the nature or origin of the blue mould which th barley of these provinces contains. No one at that station seems to be able t give the slightest information on the subject. As far as the issue of the barley t horses is concerned, the best procurable has always been given when the issue ha been made, but even then always with dispute and objection on the part of th receiving officer and Veterinary Surgeon, owing to the barley being of such a poo unnutritious quality—not half digested by horses, and so forth. There has bee no issue of barley for a year past in that station owing to the price of gram justify ing its issue in lieu, but if it should so happen that barley becomes the cheape grain again to any extent, and is tendered, it will not be accepted by the commi tee, as being unfit for food for horses, owing to its poor quality and not bein digestible; but the plea of its having blue mould in it, is one that has never yet his knowledge been issued.

SIALKOT.

From enquiries made regarding cause of the blue mould in barley, it appea that it is due to rain having fallen on the crop when ripe and before it is harveste and that owing to complaints being made regarding the quality of barley at th station, the last quarterly committee has fixed full ration of gram for use of hors from 1st instant.

PESHAWAR.

From enquiries made, it is gathered that, in the first instance, there was mo rain about harvest-time in 1876 than is usual, and that the natives are in the hal of reaping grain a little before it is quite ripe, from fear of wind, rain, and ha causing it to fall on the ground, if quite ripe, when they would suffer much los it also appears that, while the reaping is in progess, rain often falls, damps a slightly damages the grain cut, while it does no harm to that still standin The natives mingle both grains together, not being able to afford the loss whi they imagine would arise by keeping this grain separate. Another reason giv for the crops being reaped before they are ripe, is, that if the grain is stored wh quite ripe, weevils get into it much sooner than they would otherwise do, and t natives themselves do not consider that a portion of damaged grain among good gra is of much importance, and that with reference to the Punjab barley, this year, being the opinion of the Principal Veterinary Surgeon utterly unfit for food and the ca of great sickness, states that the native cavalry and police horses fed on it as w as the horses belonging to officers and others, and that Government elephan bullocks and mules are also fed on it; that the same barley husked is issued to hospitals of British regiments; that in the shape of atta, it is largely consumed villagers and poorer classes of natives throughout the Punjab.

A.

Extract.

About the year 1825, Mr. Sullivan, the then Collector of Coimbatore, distributed a quantity of barley as seed among the Badagas and Koters on the Neilgherries.

"At first, says an Ootacamund paper, this yielded very fairly, but we saw samples a few days ago of last season's growth produced in the Kaity valley and descended from Mr. Sullivan's seed, that were so bad as to be almost useless. The ear is little else than husk, the only approach to a grain being a minute steely seed; does not speak badly for the soils of the Neilgherries that they have borne crops from the one stock of seed for half a century."

No. 6950, dated 19th December 1876.

From—Colonel Willes, Commissary General,
To—The Deputy Adjutant General, Royal Artillery in India.

*No. 4696 dated 29th Novr. 1876.
No. 6658 dated 6th Decr. 1876.
No. 6659 dated 6th Do.
No. 6660 dated 6th Do.
No. 6759 dated 8th Do.
No. 6760 dated 8th Do.
No. 6761 dated 8th Do.
No. 6762 dated 8th Do.
†Mooltan, Campbelpore, Rawalpindi, Jullundur, Sialkot, Peshawar.

With reference to your memorandums, as quoted in the margin,* forwarding extracts from inspection reports of the officiating Principal Veterinary Surgeon, regarding the description of barley issued to horses at certain stations† in the Punjab, I beg to state that I believe the barley issued is the best procurable in the markets of the stations at which it is issued.

2. G. O. 152, dated 5th June 1876, directs that when barley is cheaper than gram, "and there is no objection to its issue," the grain ration of artillery and cavalry horses should, in future, consist of seven-tenths barley, and three-tenths gram. Under the above ruling, if the barley obtainable at stations is considered objectionable, it would be better for quarterly committees to fix gram instead of it, as the ration for horses.

Para 2 of Commissary General's No. 6406, dated 23rd November 1876 to Government M. D.

3. In a reference to Government, it has been suggested that the question of improving the barley grain grown in the Punjab may be enquired into by the agricultural department, and the proposals, &c., which might be made to remedy the evil be carried out, with the aid of the district officers. It is believed that its being cut before being fully ripe is the cause of the blue mould, &c. complained of, and unfortunately no improvement in this respect can be effected by this department, which can only purchase the best brought into the local market.

4. The attention of all executive officers will be drawn to the subject, and they will be directed to lay a copy of this letter before the next quarterly committees.

Endorsement by the Government of India, Military Department.

No. 1016, dated 16th March 1877.

Copy of the above forwarded to the department of Revenue, Agriculture and Commerce for information, in continuation of memorandum No. 887 dated the 16th December 1876.

Endorsement by the Government of India, Department of Revenue, Agriculture and Commerce.

No. 66, dated 21st March 1877.

Copy forwarded to the Government of the Punjab, in continuation of the letter from this department No. 4, dated 9th January last.

Endorsement by Government Punjab.

No. 328, dated 28th March 1877.

Copy forwarded to the Secretary to the Financial Commissioner, Punjab, in continuation of this office No. 57, dated 17th January last.

No. 340, dated 15th March 1877.

From—Captain R. P. Nisbet, Deputy Commissioner, Simla,
To—Gore Ouseley, Esquire, Commissioner and Superintendent, Umballa Division.

With reference to your No. 370, dated 22nd February, I have the honor to annex copies of replies received both from the Simla and Kasauli Brewery companies.

2. The information afforded by Messrs. Meakin and Co., in their well considered reply to this office enquiry, is valuable, and I have written cordially acknowledging the attention they have bestowed on the matter.

Dated 8th March 1877.

From—Messrs. Meakin & Co., Brewers, Kasauli,
To—Captain Nisbet, Deputy Commissioner, Simla.

We beg to acknowledge receipt of yours dated 5th instant, enclosing copies of correspondence regarding the quality of the barley supplied to the Government horses, and requesting us to state whether we experience any difficulty in procuring good barley for malting.

In reply, we beg to state that during the first three years we were brewing in these hills, we contracted with native grain dealers for the supply of our barley, and the quality was very inferior. The grain had evidently been stored in pits and having become damp, had heated, thereby destroying the germinating power of the grain. Finding that we could not rely on getting good grain from the natives after it had been stored through the rains, we purchased largely during harvest time, *i. e.* April and May, and rented godowns and stored the barley until it was required after the rains; the result was the grain was kept in splendid condition, and when the harvest season had been a favorable one, we do not have more than 2 per cent dead grains, whereas under the former arrangement, the average was 40 per cent, and often upwards of 60 per cent.

Sound wholesome barley can be purchased in abundance and without difficulty immediately after harvest; but after being stored in pits (as is invariably the case in the Punjab) through the rains, the grain will be found much as it is described in the officiating Principal Veterinary Surgeon's letter of the 5th September.

Our experience of the Punjab barley is that it is superior to that obtained in the North West Provinces or even Rájputána; but of course the quality varies with the season.

The barley grown in India is the kind known as "*Hordeum Herastichor*," or six rowed barley, and is identically the same as the "Begg" grown in the poorer parts of Scotland. The English barley is the "*Hordeum Vulgaree*," or two rowed barley.

By post we beg to forward two samples of barley, having been taken from the bulk now lying in our maltings, the weight of these 53½ and 54 lbs per imperial bushel, respectively. The weight of a bushel of first class English barley is 53 to 56 lbs., therefore the weight is fully equal to English grain, but the Indian barley being a much coarser grain, the proportion of husk and insoluble matter is very

much greater than in English barley. All the barley used by us (upwards of 30,000 maunds per season) is most carefully screened and cleaned, being passed four times over corn screens to take out all grain seeds and light and thin grains, so that only the very best of the grain is used; upwards of 25 per cent of this immature grain is separated by the machines, leaving only the plump sound grains for malting.

Dated 2nd March 1877.

From—Messrs. E. Dyer & Co., Brewers &c., Simla,
To—The Deputy Commissioner, Simla.

Returns correspondence forwarded and begs to state that good stout malting barley is difficult to procure in any quantity.

Endorsement by Commissioner, Umballa.
No. 68, dated 19th March 1877.

Copy of above forwarded to J. A. E. Miller Esquire, Secretary to Financial Commissioner, Punjab, in reply to No. 552 dated 1st February.

No. 192, dated 30th May 1877.

From—Major C. Beadon, Deputy Commissioner, Jullundur.
To—A. Brandreth, Esquire, Commissioner and Superintendent, Jullundur Division.

With reference to your No. 912, dated the 23rd ultimo, and to previous correspondence upon the subject of inferior barley supplied to the government horses of the Royal Artillery at Jullundur; I have to report as follows:—

2. The Principal Veterinary Surgeon, Bengal Army, in his report to Army head quarters, said of the specimens of barley which were sent him from the store supplied to the battery at this place, that "the grain was small, badly nourished, "and largely adulterated with indifferent wheat, indifferent grain and three different "kinds of small seeds"; and further that this adulteration extended to about ⅓ of the whole specimen, "while the barley itself had a peculiar, rusty blue appearance, indicating damage by wet."

3. In the correspondence forwarded to me with your No. 307, of the 15th February, it is suggested that the barley is harvested in a mouldy state, and it is upon *this* point that I understand I am called upon for report.

4. On receipt of your letter above mentioned, I made enquires as to whence the battery supplies had been obtained, and was told that they came through contractors who chiefly received their stock from the grain producing districts across the Sutlej: that local supply did not equal local wants, and I have learnt further, from the officer commanding, that since Mr. Collins' inspection, in November last, barley has not been given to the horses of the battery.

5. It remained to be seen whether the local produce was gathered in a mouldy state, and for this purpose, I called on tahsildars to furnish me with small samples taken at random from the out-turn of the crop about to be cut.

6. I have now the honor to transmit six such samples, one from each of the 4 tahsils, and two that I took myself from threshing places in the vicinity of Jullundur.

I do not pretend to be a judge of what is good barley, but all these specimens seem to me to be inferior, badly nourished and possibly mouldy, excepting perhaps that obtained from Phillour.

7. The samples obtained by myself were collected as a check upon the tahsil specimens, for though I directed that the barley should be gathered at random,

it occurred to me that tahsildars would hesitate to submit grain that was adulterated, though it might be inferior. One of my samples, it will be observed, is highly adulterated with wheat, gram and other seeds, and I have but little doubt that nearly one half of the barley produced in this district contains a similar admixture of foreign grains.

8. On visiting the fields round about and questioning the agriculturists, I ascertained that, as a rule, barley *is* cut in an incomplete state of ripeness, and this of course fully accounts for the inferiority of the grain. If a crop is cut before the seed is fully developed and while any sap remains in the stem, it stands to reason, that, in the process of drying, the seeds should shrink; and if, as is done in this country, the threshing or treading of the grain takes place a day or two days after the crop has been cut, or before it is thoroughly dried, it is but natural that the grain, when stored in a semi-green state, should immediately begin to rot and develop mould or show other signs of decomposition.

9. On asking the reason why crops are cut in an unripe state, I was told that poverty was the main cause; that poor zamindárs, who had often many mouths to feed and cattle to provide with fodder, would not have patience to let the crop fully ripen, but would cut, carry and thresh it in the same day, and that on the second or third day they and their families would be consuming the grain and their cattle the straw, and that this served to keep them going till the wheat was harvested.

10. Again, as concerning the cutting and carrying of all crops in one day, my informants told me that, in a country of fields without enclosures, the opportunities for theft would be too great if the crops were allowed to lie about at night in sheaves as is practised in other countries.

No. 1340, dated 9th June 1877.

From—A. Brandreth, Esquire, Commissioner and Superintendent, Jullundur Division,
To—J. A. E. Miller, Esquire, Secretary to Financial Commissioner, Punjab.

In reply to your letter No. 548, dated 1st February last, I beg to submit a copy of an exceedingly interesting and careful report, No. 192, dated 30th ultimo, by Major Beadon on the subject. I am afraid that the explanation which he gives is correct, and that it is the poverty of the *agriculturists* which leads both to the early cutting and to the thefts. The only remedy I can suggest is an extra price for good barley which would probably be grown to meet the demand. No other remedy seems possible.

No. 53—406, dated 5th March 1877.

From—Major Genl. R. G. Taylor, C. B., C. S. I., *Commissioner and Superintendent, Amritsar Division.*
To—J. A. E. Miller, Esquire, Secretary to Financial Commissioner, Punjab.

In reply to his No. 549, of 1st ultimo, regarding inferior quality of grains issued to government horses, and calling for report whether the barley is mouldy at time of harvest, has the honor to annex copy of letter No. 46, of 20th ultimo from Deputy Commissioner, Sialkot, on the subject.

No. 46, dated 21st February 1877.

From—The Deputy Commissioner, Sialkot;
To—The Commissioner and Superintendent, Amritsar Division.

In returning the correspondence received with his No. 42—261, of 13th instant, states that barley is said to be mouldy, as a rule, at time of harvest, and the mould

is ascribed to its becoming wet by rain when fit to be cut. Would further add that barley is generally sown in inferior and unirrigated soil, and proper regard is not paid to the description of seed used.

No. 64, dated 22nd February 1877.

From—D. C. Macnabb, Esquire, Commissioner and Superintendent, Rawalpindi Divn.,
To—J. A. E. Miller, Esquire, Secretary to Financial Commissioner, Punjab.

With reference to your docket No. 550, dated 1st instant, I have the honor to submit herewith a letter No. 1, dated 20th idem, in original, from Mr. H. Whymper, Manager of the Murree Brewery Company, on the subject of the complaint regarding inferiority of grain by commissariat department.

2. I think the suggestion of teaching the zamíndárs to clear their seed grain of weevil and dead corn, by stirring it in water before sowing, practical.

3. The chemical solutions proposed would of course never be used.

Dated 20th February 1877.

From—H. Whymper, Esquire, Managing Brewer, Murree Brewery Company,
To—The Commissioner and Superintendent, Rawalpindi Division.

I am in receipt of your memo No. 429, dated 13th current.

In reply, I have to state that the company has the greatest difficulty in obtaining a sufficient quantity of barley fit for malting purposes, and as its improvement is a matter of great consequence to this company, I trust you will not object to the length of my replies to your queries.

I have not personally seen much rust, smut, or mildew, for the reason that I usually only see the grain after it has undergone a rough cleaning by the contractor, and I have not heard any very bad accounts of smut &c. I have, however, no doubt the grain is most carelessly sown, harvested, and stored, from the enormous proportion of thin, dead, and weevil eaten corns, which I find in even the best samples of barley. I may here perhaps remark that it is improbable that smut originates from bad storing: Cooke, in his work on "Microscopic Fungi," White, in "The Maltster," and Wilson, in "Farm Crops," and other authorities, all agree that the bulk of smut is seldom carried into a granary, but is shaken off, and falls into the soil before or at harvesting, and is from the soil reproduced on the next crop of grains being sown. Wilson says: "The spores are mostly dispersed over the field before the "corn is harvested, and therefore are not likely to be attached in any quantity to "the grain." Further on he writes, with reference to steeping the seed in alkaline or mineral solutions: "It is not an expensive or troublesome process, and if any "spores should adhere to the grain, they would be destroyed or removed in the "steep." White says, with reference to the same matter: "Parcels of different "kinds of seed barley, taken from different soils, have been sown and cultivated in "the same manner, in infected ground, and the disease appeared in all alike." I could multiply authorities as to this. The most approved remedy seems to be to soak the seed grain in a solution of sulphate of copper, or sulphate of iron, and as this steeping helps in another matter I will allude to further on, I should think it might be tried with advantage.

From the fact that strong plants are less likely to be attacked with rust than weak ones, the remedy appears to be change and careful selection of seed.

What the company has found so troublesome is the stained corns, which will not germinate, and those which are weevil-eaten. The first arises from grain having

got wet before stacking, or from the grain being stacked before it is thoroughly ripe, or from storing in damp places; in either of these cases, the life of the grain is destroyed. From malting experience I believe zamíndárs must sow every year about 15% more grain than should be necessary, from the large proportion of dead corns.

Weevils are however our greatest nuisance, and their enormous numbers must occasion a heavy loss in any year to zamíndárs. Not only do they eat up grain, but they indirectly cause the rapid development of a blue mould. On our malting floors, when weather is warm, every weevil-eaten corn has blue mould somewhere about it, and it is merely a question of days for this mould to spread over a great proportion of the floor. There can be no doubt the same thing takes place in cultivation; natives are well aware of the damage weevils do, and they use their *chujs* with some effect in separating the weevil-eaten corn. There is, however, a very simple method of getting rid of them from any small quantity of grain. If you will kindly take a handful of the sample of barley marked No. 1, and throw it into a tumbler of water, stirring it briskly up, you will see all the weevil-eaten corns, and the weevils themselves, at once float on the top of the water. These can be skimmed off (and burnt) at the same time that the grain is steeping in the solution of sulphate of copper before mentioned; this steeping thus would perform two duties.

I believe that removing weevil, steeping in some solution, and a careful selection of seed would readily effect a great improvement in the barley of this district. If you will look at barley sample No. 2, which I send you, you will see it is a sample which would pass muster anywhere; this I made by simply passing barley (of which No. 1 is a fair sample) through a rotary screen; heavy seed like this would give immense crops; it is to be easily obtained, and I would strongly advocate its use.

No. 195, dated 4th April 1877.

From—The Deputy Commissioner, Peshawar,
To—The Commissioner and Superintendent, Peshawar Division.

In reply to his No. 311, dated 15th ultimo and reminder No. 545, dated 13th instant, has the honor to return the enclosures of the first mentioned letter and to forward in reply copies of a correspondence (as per margin) between himself and the executive commissariat officer, Peshawar, from which it will be apparent that the barley in the Peshawar district becomes mouldy at time of harvest owing to rain falling and moistening the cut crops as they lie on the ground. Enquiry made by undersigned from other sources establishes the correctness of the facts reported by the executive commissariat officer to his own department.

(1). Deputy Commissioner's No. 378, dated 17th March 1877.
(2). Executive Commissariat Officer's No. 1271, dated 20th idem.

No. 378, dated 17th March 1877.

From—The Deputy Commissioner, Peshawar,
To—The Executive Commissariat Officer, Peshawar.

I have the honor, to forward, in original, copies of a correspondence forwarded to me by the Commissioner and Superintendent of the division for report, as to whether the barley in this district is mouldy at time of harvest or subsequently becomes so.

2. Before doing so, I should feel much obliged by your informing me if the barley usually supplied to you is "diseased with a mouldy taint," for it is quite possible, as the executive commissariat officer of Rawalpindi writes in his No. 647, dated 6th November 1876 (one of the letters in the correspondence) that the parti-

cular samples of Peshawar barley referred to may have got wetted or damp after issue by your department or * * even in transit.

3. The favor of an early and full reply is solicited.

Memo No. 1271, dated 20th March 1877.

From—The Executive Commissariat Officer, Peshawar,
To—The Deputy Commissioner, Peshawar.

In reply to his No. 378, dated 17th instant, has the honor to forward for his perusal a copy of this office letter No. 9 dated 6th January 1877, to the Deputy Commissary General on the subject of barley. The enclosures of his Memo are herewith returned.

No. 735—4109, dated 20th July 1877.

From—The Secretary to Financial Commissioner, Punjab,
To—The Secretary to Government, Punjab.

On receipt of your No. 57 of 17th January 1877, forwarding for report the correspondence received from the Government of India, regarding the quality of the barley supplied for army horses in the Punjab, the Financial Commissioner referred to the Commissioners Jullundur, Amritsar, Rawalpindi and Peshawar for opinion and report by the Deputy Commissioners concerned. The Commissioners of Umballa and Rawalpindi were also asked to enquire whether the breweries at Simla and Murree had any difficulty in obtaining barley of good quality. The replies received are forwarded herewith, together with an abstract of them, and also the samples of barley mentioned in the report of the Deputy Commissioner of Jullundur.

Result of the enquiry.

2. The result of the enquiry is that the barley in the market is sometimes blue mouldy, and that this is caused, partly by its being cut before it is quite ripe, and partly by its being stored without sufficient care, and in a damp state or in a damp place.

Remedy adopted by Messrs. Meakin & Co., for getting good barley.

3. To meet the latter difficulty, Messrs. Meakin and Co., Brewers of Simla, adopted a very practical remedy. Barley is in the market in the spring, but is not required for brewing till October. Messrs. Meakin & Co. found that, by waiting till October, they could only obtain barley that had been injured by defective storage. They accordingly purchased their supplies at harvest time (April and May) and stored it themselves till wanted for brewing. The result was that the barley was in very good condition.

Difficulty experienced by the Murree Brewery Company in obtaining good barley.

4. The Murree Brewery Company appears to have had some difficulty in obtaining good barley. The manager has found a large percentage of dead and weevil eaten grains in the supply of barley, which are the result of the crop being cut before it is ripe, and being stacked and stored damp. The report however does not state at what time of the year the barley is purchased.

Remedy suggested by Commissioner Jullundur.

5. The Commissioner of Jullundur considers that the only remedy for the evils complained of is to offer an "extra price for good barley."

The cause of barley being mixed with other grains.

6. The report of the Deputy Commissioner of Jullundur and other reports in the correspondence show that barley is frequently found intermixed with other grain. This is probably the result of careless storage, and insufficient space for storage, and the evil is perpetuated with every fresh crop, as the seed is sown just as it is obtained, mixed with other grain.

How dead grain may be eliminated.

7. The Commissioner of Rawalpindi draws attention to the suggestion of the manager of the Murree Brewery that dead grain might be eliminated by stirring the seed in water, which causes the dead grains to float to the surface.

Financial Commissioner's opinion on the subject.

8. The Financial Commissioner is of opinion that improvement in the treatment of the seed would doubtless lead to improvement in the crop, but that any improvement in this direction will be very difficult to effect.

How good barley may be obtained.

9. It would seem that good barley is obtainable if pains are taken to secure a supply of it, and that it remains sound if carefully stored.

Injury caused by fall of rain at time of harvest.

10. Although the practice of cutting crops before they are ripe is very general, it is probable that the injury to the grain from this cause only becomes serious if rain happens to fall at harvest time while the crops are lying cut on the ground, and if there is not sufficient sunshine afterwards to dry and ripen them before they are stored. Any injury that may be due to this cause should affect crops of all kinds and especially wheat, the most important crop in the Punjab, whereas Punjab wheat is admitted to be generally of good quality and not mouldy.

Bad barley not to form the prescribed ration for army horses.

11. It appears from the correspondence received with your No. 328 of 20th March 1877, that the Commissary General has pointed out to executive officers that when barley is considered objectionable, it need not form part of the prescribed ration for army horses, and that the commissariat department can do nothing more than purchase the best barley that the market offers.

The only practical remedy for obtaining good barley.

12. The rejection of bad barley and the encouragement of good by the offer of remunerative prices seems to be the only practical remedy available, as any attempt to alter the habits of the entire agricultural community with respect to their treatment of their crops on the ground, the selection of seed, and the manner of storing grain, could only be attended by a very faint and remote prospect of success.

No. 882, dated 4th August 1877.

From—The Offg. Secretary to Government, Punjab,
To—The Offg. Secretary to Government of India, Department of Revenue, Agriculture and Commerce.

No. 4, dated 9th Jany.
No. 66, dated 1st March.

In reply to your letters marginally noted, relating to the inferior kind of barley supplied to army horses in the Punjab; I am desired to forward for the information of the Government of India, copy of a letter from the Financial Commissioner, Punjab, No. 735, dated 20th ultimo, and enclosures, reporting on the subject, and to state that the Hon'ble the Lieutenant Governor concurs in Mr. Ouseley's conclusions expressed in the last para of his letter, that the only practical remedy for obtaining good barley is the offer of remunerative prices for the best description.

2. The samples of barley, mentioned in Financial Commissioner's 1st para, are also forwarded.

Endorsement by Government, Punjab.

No. 883, dated 4th August 1877.

Copy forwarded to the Secretary to Financial Commissioner, Punjab, with a suggestion that the papers be printed as a selection from the records of the Financial Commissioner's office. Original correspondence forwarded with his letter No. 735, dated 20th ultimo, herewith returned.